

# ACUTE EFFECTS OF WOODSMOKE EXPOSURE AS MEASURED BY PERSONAL CARBON MONOXIDE ON HEART RATE VARIABILITY IN GUATEMALA

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**Background and Aims:** Evidence suggests that fine particulate air pollution is a cause of cardiovascular disease, but little is known about the effects of indoor air pollution from household solid fuel use in developing countries. In the RESPIRE randomized trial of a chimney woodstove, we examine short-term associations between personal carbon monoxide (CO), as a proxy for woodsmoke, and heart rate variability (HRV).

**Methods:** Electrocardiogram sessions lasting 20 hours were repeated up to three times among 49 intervention (chimney stove) and 70 control (open fire) women 38 to 84 years of age. HRV values (SDNN, RMSSD, HF, LF, VLF) were recorded for each 30-minute period. Continuous personal CO exposures were measured starting 24 hours before and during each electrocardiogram. Linear mixed effects models with random intercept for subject, random intercept for study day nested within subject, and a first-order autoregressive term within subject-day were used to estimate the association between natural log transformed 30-min HRV and CO (1-hour, 4-hour, and 8-hour moving averages), adjusting for hour of day (dummy variable for each hour), age, body mass index, asset index, ever smoking, secondhand tobacco smoke, wood-fired sauna use, season, ambient temperature, and rainfall.

**Results:** The means of 30-min average personal CO levels were 2.6 (n=4265, SD=2.5, range=0.2-20.6) and 1.0 (n=4426, SD=1.3, range=0.2-9.3) ppm in the open fire and chimney stove groups, respectively. All models we ran suggest HRV increases with personal CO. Each 1 ppm increase in 4-hour moving average CO was associated with a 4.6% (95% CI: 1.2, 8.2) increase in LF and a 2.4% (95% CI: 0.3, 4.6) increase in VLF. Associations with 8-hour moving average CO were similar and were significant for LF, VLF, and RMSSD.

**Conclusions:** Personal exposure to woodsmoke was associated with increased HRV, particularly the low frequency components, suggesting that woodsmoke exposure has acute effects on the autonomic control of the heart.